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(71) Applicant: SAMSUNG ELECTRONICS CO., LTD. [KR/KR]; 416 Maetan-dong, Paldal-gu, Suwon-city, Kyungki-do 442-373 (KR).

(72) Inventors: LEE, Kyung-Geun; 122-1002 Sibeom Hanshin Apt., 87, Seohyun-dong, Bundang-gu, Seongnam-si, Gyeonggi-do 463-050 (KR). KO, Jung-Wan; 315-401 Daewoo Apt., 956-2 Cheongmyung Maeul 3-danji, Youngtong-dong, Paldal-gu, Suwon-si, Gyeonggi-do 442-470 (KR). PARK, In-Sik; 615-801 Shinnamushil Kukdong Apt., 967-2 Youngtong 2-dong, Paldal-gu, Suwon-si, Gyeonggi-do 442-470 (KR).

(74) Agent: LEE, Young-Pil; The Cheonghwa Building, 1571-18 Seocho-dong, Seocho-gu, Seoul 137-874 (KR).

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(54) Title: OPTICAL INFORMATION STORAGE MEDIUM AND RECORDING/REPRODUCING METHOD FOR THE SAME

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BP	CONTENTS	THE NUMBER OF BYTES
0	RECORDABLE SPEED FLAG OR CODE	ONE BYTE
1~	RESERVED	RESERVED

(57) Abstract: Provided are an optical information storage medium in which information on recording layers that have the same reproduction channel characteristics or different reproduction channel characteristics, and a recording/reproducing method for the optical information storage medium. Nominal recording speed information is recorded in a read-only zone, and maximum and/or minimum recordable speed information is recorded in a recordable zone of the area other than a user data area. The optical information storage medium addresses the case where the nominal recording speed is not satisfied due to errors occurring during the manufacture of the storage medium. Thus, the defective disc proportion can be reduced, and loss of user data due to application of inaccurate recording layer information can be prevented.

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OPTICAL INFORMATION STORAGE MEDIUM AND RECORDING/REPRODUCING METHOD FOR THE SAME

Technical Field

The present invention relates to an optical information storage medium and a recording/reproducing method therefor, and more particularly, to an optical information storage medium on which optical information has the same channel characteristics or different recording speed information is recorded thereon, and a recording/reproducing method for the optical information storage medium.

Background Art

Optical disks or optical information storage media are widely used in optical pickup devices that record/reproduce information in a non-contact manner. Types of optical disks are compact discs (CD), digital versatile discs (DVD), and high density DVDs (HD-DVD). Optical disks capable of recording, erasing, and reproducing data are CD-R, CD-RW, DVD-RW, DVD-RAM, DVD+RW, or the like.

With an increase in the recording density of such optical disks, the performance of the disc drive is improved. Since the recording characteristics of such an optical disk match the recording speed of the disk drive, data can reliably be recorded or reproduced when a disk drive satisfies the recording characteristics of the optical disk. While a general disc drive can reliably record data on a low speed disc, it does not satisfy the recording characteristics of a high-speed disc, and thus it may frequently damage the user data. A disc drive for a high-speed disc can also damage the user data when recording the data on a low speed disc.

Accordingly, the recording speed information is needed to reliably record data. In order to obtain such information, the recording speed of

record data. In order to obtain such information, the recording speed of the disc is recorded in a predetermined region of the disc, and the disc drive recognizes the recording speed of a desired disc and records data at a predetermined recording speed of the desired disc. For example, in a case of a 2X-speed disc, the recording speed of the disc is recorded in a predetermined region of the disc prior to its shipment, and thus the disc drive can record data referring to the recording characteristics according to the recording speed of the disc recorded thereon.

However, quite frequently, the recording speed of a disc does not reach the nominal recording speed of the disc during testing. For example, after a 4X-speed disc is manufactured and the recording speed of the disc is recorded in a predetermined region of the disc, the true recording speed of the disc does not actually reach the 4X speed. At this time, such disc cannot be used as a 4X-speed disc, but it may be appropriate as a 3X-speed disc or a 2X-speed disc. Then, the disc drive recognizes the disc as the 4X-speed disc because the recording speed is 4X speed, and thus it tries to record the data at the 4X speed. However, since the recording speed does not actually reach the 4X speed, and thus the user data cannot be recorded normally and can be damaged. Therefore, the 4X- speed disc, which may be appropriate as a 3X-speed disc or a 2X-speed disc, cannot but be discarded as a defective disc.

Accordingly, a method for using such disc is needed, and a subsequent process is needed in order to handle a case where the recording speed of the disc decreases due to various manufacturing conditions of the disc.

Disclosure of the Invention

To solve the above and other problems, it is an aspect of the present invention to provide an optical information storage medium and a method of reproducing the information, by which recording speed

information is recorded using different channel characteristics or the same channel characteristics, the recording speed information, which is reproduced using a differential signal channel or a sum channel is recorded as read-only data, and the recording speed that is reproduced using the sum channel is recorded in a re-recordable zone of an area other than a user data area, and thus the user data can be recorded at an optimal speed on the storage medium without any damages.

According to one aspect of the present invention, there is provided an optical information storage medium, wherein formal recording speed information, which is reproduced by a differential signal channel, is recorded on a read-only area, and maximum recordable speed information, which is reproduced by a sum channel, is recorded in a recordable zone of an area other than a user data area.

The formal recording speed information is recorded in a high-frequency wobble.

A lead-in area, a user data are, and a lead-out area are included, and the maximum recordable speed information is recorded in a re-recordable data zone of at least one of the lead-in area and the lead-out area.

The maximum recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

The re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the maximum recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

The maximum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

Minimum recordable speed information is also recorded in the re-recordable data zones of the lead-in and lead-out areas.

According to another aspect of the present invention there is provided an optical information storage medium, wherein formal recording speed information, which is reproduced by a differential signal channel or a sum channel, and a recordable speed information, which is reproduced by a sum channel, are recorded.

According to another aspect of the present invention, there is provided a method of recording/reproducing data in/from an optical information storage medium that is constituted of a lead-in area, a user data area, and a lead-out area, the method comprising: recording formal recording speed information, which is reproduced by a differential signal channel or a sum channel, in a read-only data zone of at least one of the lead-in area and the lead-out area; recording maximum recordable speed information, which is reproduced by a sum channel, in a re-recordable data zone of at least one of the lead-in area and the lead-out area; and recognizing the maximum recordable speed information using a disc drive and recording data on the optical information storage medium.

According to another aspect of the present invention, there is provided there is provided a method of recording/reproducing data in/from an optical information storage medium that is constituted of a lead-in area, a user data area, and a lead-out area, the method comprising: recording formal recording speed information, which is reproduced by a differential signal channel or a sum channel, in a read-only data zone of at least one of the lead-in area and the lead-out area; recording recordable speed information, which is reproduced by a sum channel, in a re-recordable data zone of at least one of the lead-in area and the lead-out area; and recognizing the recordable speed information using a disc drive and recording data on the optical information storage medium.

Brief Description of the Drawings

The above and other aspects and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 illustrates the structure of a lead-in area of an optical information storage medium according to the present invention;

FIG. 2 illustrates a part of the data structure of an optical information storage medium; and

FIG. 3A is a schematic view for explaining an optical information storage medium according to a first embodiment of the present invention and a recording/reproducing method therefor;

FIG. 3B is a schematic view for explaining an optical information storage medium according to a second embodiment of the present invention and a recording/reproducing method therefor;

FIG. 4 is a schematic view for explaining an optical information storage medium according to a third embodiment of the present invention and a recording/reproducing method therefor; and

FIG. 5 is a block diagram illustrating a method of determining a recording speed of an optical information storage medium according to the present invention.

Best mode for carrying out the Invention

FIG. 1 schematically shows the structure of a lead-in area, a user data area, and a lead-out area of an optical information storage medium. The lead-in area is formed of pits or in a high frequency wobble on the innermost circumference of the disk and includes a read-only data zone 10, a connection zone 20, and a re-recordable data zone 30. The read-only data zone 10 contains the basic information on the disk.

The read-only data zone 10 includes a disc information zone 10a wherein a formal recording speed of the disc is recorded. The formal

recording speed of the disc denotes a recording speed determined during the design of the disc or in a format that describes the disc. For example, formal recording speed information, which is read-only data, can be recorded in a land pre-pit (LPP) or a pit or recorded as a high-frequency wobble signal. In this respect, a high-frequency wobble signal is disclosed in Korean Patent Application No. 2001-023747 filed by the applicant of the present invention, and represents a wobble signal that has a relatively higher frequency than a wobble signal formed in a user data area. The formal recording speed information recorded in a high-frequency wobble is reproduced using a differential signal channel ch2 that uses a push-pull signal. The formal recording speed information recorded in a pit is reproduced using a sum channel ch1. Upon data recording on a disk, the formal recording speed for the disk recorded as described above is recognized by a disc drive so that the user data can be recorded at an optimal recording speed.

The size of the disc, a version number, recording conditions, or the like is also recorded in the disc information zone 10a.

The connection zone 20 can include a transition zone that connects the read-only data zone 10 to the re-recordable data zone 30. The connection zone 20 can be a mirror zone or can be a wobble groove area instead.

The re-recordable data zone 30 can include a disc test zone 30a, a drive test zone 30b, a disc control data zone 30c, and a defect management zone 30d. The disc control data zone 30c includes at least one disc control area in which information regarding a disc control is recorded. For example, first through fourth disc control areas 30c-1, 30c-2, 30c-3, and 30c-4 are included. At least one reserved area, for example, two reserved areas 30c-5 and 30c-6, can be further included to record other information.

Since the lead-out area has a similar structure to the lead-in area, the lead-out area will not be described in detail.

Ideally, an optical information storage medium must be able to record data according to the formal recording speed information recorded in the disc-related information zone 10a. However, in practice, due to errors occurring during the manufacture of the optical information storage medium, the formal recording speed does not satisfy the predetermined recording characteristics in accordance with the formal recording speed information. Hence, the data is recorded at a speed that is lower than the formal recording speed. In this case, instead of the formal recording speed, effective recording speed information that is recordable and actually satisfies predetermined recording characteristics needs to be newly recorded.

In a recording/reproducing method for an optical information storage medium according to a first embodiment of the present invention, maximum recordable speed is recorded in a recordable zone of the areas other than the user data area. For example, the maximum recordable speed information can be recorded in a predetermined area of the re-recordable data zone 30. Meanwhile, the maximum recordable speed information, which is data reproduced using the sum channel ch1, can be recorded in the same manner as data is recorded in the user data area.

Referring to FIG. 2, the predetermined area of the re-recordable data zone 30 is composed of a plurality of bytes and can store the maximum recordable speed information in one byte among the plurality of bytes. For example, the re-recordable data zone 30 stores a recordable speed flag or a recordable speed code using at least one bit existing at a zero byte position (BP) 35 in the predetermined area or using a bit combination of a predetermined byte, respectively. Although the maximum recordable speed is recorded at the zero BP 35 in FIG. 2, it may be recorded at a desired BP other than a zero BP. The maximum recordable speed information may also be recorded using a plurality of bytes instead of one byte.

Looking at the internal structure of the zero BP 35, as shown in FIG. 3, the zero BP 35 is composed of 8 bits, that is, first through seventh bits b0 through b7. For example, the recordable speed flag or a code using the bit combination of a predetermined byte can be recorded using the seventh and the sixth bits b7 and b6. The other bits are reserved. For example, if a formal recording speed is 5X, the seventh and the sixth bits are recorded as 00b, a fact which indicates that the data can be recorded in accordance with the formal recording speed. That is, the data can be recorded at the maximum recordable speed of 5X. If the seventh and the sixth bits are recorded as 01b, the data can be recorded at the maximum recordable speed of 2X and cannot be recorded at a speed that is higher than 2X. If they are recorded as 10b, the data can be recorded at the maximum recordable speed of 3X. If the seventh and the sixth bits are recorded as 11b, the data can be recorded at the maximum recordable speed of 4X.

If a formal recording speed is 3X, the seventh and sixth bits are recorded as 00b, the data can be recorded in accordance with the formal recording speed of 3X. If they are recorded as 01b, the data can be recorded at the maximum recordable speed of 2X and cannot be recorded at a speed that is higher than 2X.

In order to apply the internal structure of the zero BP 35 to a disc designed to have a recording speed of over 6X, three bits can be used to record the data. For example, if a formal recording speed is more than 6X, 000b indicates that the data can be recorded at the maximum recordable speed of 6X and cannot be recorded at a recording speed higher more than 6X. Similarly, 001b indicates that the data can be recorded at the maximum recordable speed of 2X, 010b indicates that the data can be recorded at the maximum recordable speed of 3X. When the maximum recordable speed is recorded as 00b or 000b, the data can be recorded at the formal recording speed.

In the above embodiment, the maximum recordable speed is recoded using 2 or 4 bits. However, the maximum recordable speed can be recorded using 4 through 8 bits. In other words, recordable effective recording layer information can be recorded using at least one bit or a bit combination of a byte in a re-recordable area. Apparentiy, a plurality of bytes instead of one byte can also be used.

As described above, the maximum recordable speed is recorded in a predetermined area of a re-recordable data zone of at least one of a lead-in area and a lead-out area. Then, a disc drive records data at an optimal recording speed in accordance with the maximum recordable speed.

Preferably, the maximum recordable speed information can be recorded in at least one of the disc control data areas 30c-1, 30c-2, 30c-3, and 30c-4 of the disc control data zone 30c. Alternatively, the maximum recordable speed information can be recorded in the reserved areas 30c-5 and 30c-6. In the above, the case where the maximum recordable speed is recorded in the re-recordable data zone of a lead-in area has been described. However, the maximum recordable speed information can be recorded in a re-recordable data zone of a lead-out area provided on the side of the outer circumference of a storage medium.

In order to increase reliability, the maximum recordable speed information can be redundantly recorded in both the recordable data zones of the lead-in and lead-out areas.

However, the optical information recording medium according to the first embodiment of the present invention stores maximum recordable information in a predetermined area of the re-recordable data zone of at least one of the lead-in and lead-out areas. The maximum recordable speed information can be recorded as a speed flag or code using at least one bit or a bit combination of a predetermined byte. Alternatively, a plurality of bytes can be used to record the maximum

recordable speed information.

Although the maximum recordable speed is recorded in the zero BP as described above, the maximum recordable speed information can also be recorded in a BP other than the zero BP.

In a recording/reproducing method for an optical information recording medium according to a second embodiment of the present invention, the maximum recordable speed is recorded in all of the bits that constitute a recordable zone of the areas other than the user data area. For example, the maximum speed information can be recorded in a predetermined area of the re-recordable data zone 30. Here, the re-recordable data zone 30 is also included in the lead-out area.

The maximum and minimum recordable speed information can be recorded in a predetermined area, for example, either the disc control data areas 30c-1, 30c-2, 30c-3, and 30c-4 or the reserved areas 30c-5 and 30c-6, in the re-recordable data zone 30. Referring to FIG. 3B, either the disc control data areas 30c-1, 30c-2, 30c-3, and 30c-4 or the reserved areas 30c-5 and 30c-6 are constituted of a plurality of bytes. The maximum and minimum recordable speed information is recorded using all of 8 bits that constitute each byte. Here, the maximum and minimum recordable speed information, which is data reproduced using the sum channel ch1, can be recorded in the same manner as data is recorded in the user data area.

In order to increase reliability, the maximum and minimum recordable speed information can be redundantly recorded in both the recordable data zones of the lead-in and lead-out area.

To be more specific, the following shows a case where the formal recording speed is 8X, but actually it is determined that the disc records data at 5-7X when the testing of recording characteristics of the disc is performed. Here, the maximum recordable speed is 7X, and the minimum recordable speed is 5X. Referring to FIG. 3B, the maximum recordable speed is recorded in seven through four bits b7, b6, b5, and

b4, the minimum recordable speed is recorded in three through zero bits b3, b2, b1, and b0. As described above, the maximum or minimum recordable speed can be recorded using 4 bits in the following table.

[Table 1]

Bit	Recording speed
0000b	2X
0001b	3X
0010b	4X
0011b	5X
0100b	6X
0101b	7X
0110b	8X
0111b	9X

Referring to Table 1, the recording speed 5X-7X can be presented as 01010011b. Here, the maximum recordable speed and the minimum recordable speed are presented using a combination of four bits. However, the maximum recordable speed and the minimum recordable speed can be presented using a combination of two or three bits.

In a recording/reproducing method for an optical information recording medium according to a second embodiment of the present invention, maximum and minimum recordable speed is recorded in all of the bits that constitute a recordable zone of the areas other than the user data area. The maximum and minimum recordable speed information can be recorded using a combination of two through four bits, or the maximum and minimum recordable speed information can be recorded in different BPs.

An optical information storage medium according to a third embodiment of the present invention and a recording/reproducing method used for the same will now be described.

According to the third embodiment, the recordable speed is recorded in a predetermined area of a re-recordable area of at least one of the lead-in and lead-out areas by using each bit.

For example, recordable speed information can be recorded in the disc control data area 30c-1, 30c-2, 30c-3, 30c-5 or the reserved area 30c-5, 30c-6, using a bit or a combination of bits in a predetermined area of the re-recordable data zone 30 shown in FIG. 1. The disc control data area 30c-1, 30c-2, 30c-3, 30c-5 and the reserved area 30c-5, 30c-6 are constituted of a plurality of bytes, and the recordable speed is recorded by using 8 bits of one byte of the plurality of bytes.

More particularly, each bit of a BP corresponds to different recordable speeds, and corresponding recordable speed information is recorded by using each bit. For example, each bit and the corresponding recordable speeds are as follows.

[Table 2]

BP	Recordable speed
7b	2X
6b	3X
5b	4X
4b	5X
3b	6X
2b	7X
1b	8X
0b	9X

Referring to FIG. 2, all the recordable speeds can be presented by recording the recordable speed information in a corresponding bit position. That is, if 0b is recorded in the seventh bit 7b, the data can be recorded at 9X. If 1b is recorded in the seventh bit 7b, the data cannot be recorded at 9X. If 0b is recorded in the sixth bit 6b, the data can be

recorded at 3X. If 1b is recorded in the sixth bit 6b, the data cannot be recorded at 3X. The same applies to the fifth through 0-th bits 5b, 4b, 3b, 2b, 1b, and 0b, so that the recordable speed information can be recorded in a corresponding bit position.

In the third embodiment, if the formal recording speed is 9X and the disc satisfies the predetermined recording characteristics of a 5X-7X disc when the recording characteristics of the disc are tested, the recordable speed can be recorded as 111110001b with reference to Table 2.

In order to increase reliability, the recordable speed can be redundantly recorded in both the recordable data zones of the lead-in and lead-out areas.

Information on a recording possibility for a particular speed can also be recorded as follows.

[Table 3]

BP	Recordable speed
7b	Speed 1
6b	Speed 2
5b	Speed 3
4b	Speed 4
3b	Speed 5
2b	Speed 6
1b	Speed 7
0b	Speed 8

For example, if speed 1 in table 3 is 3m/s, speed 2 is 5m/s, speed 3 is 7m/s, and the seventh bit 7b, the sixth bit 6b, and the fifth bit 5b are 0b, 1b, 1b respectively, recording can be performed only at a speed 3m/s. If the bits are 0b, 0b, 1b respectively, both recording speeds of 3m/s and 5m/s are possible. Here, a recordable speed may be a real number as well as a natural number.

FIG. 5 is a block diagram illustrating a method of determining a recording speed of an optical information storage medium according to the present invention. In order to record information on a disc, first, the disc is loaded in a disc drive, and a formal recording speed, which is a piece of disc-related information, is read as a sum channel ch1 or a differential signal channel ch2, which uses a push-pull signal, from a predetermined area of the disc and stored in a memory. Next, recordable speed information is reproduced by the sum channel ch1 from at least one area of the lead-in and lead-out areas. Finally, the data is recorded in accordance with the recordable speed information reproduced by the sum channel. Recording conditions related to particular recording speed prescribed on the disc as shown in table 3 are provided when disc-related information corresponding to the recording conditions is read.

In the second and third embodiments, since all recordable speeds can be mentioned, more accurate, concrete recordable speed information can be provided. In particular, as the recording speed of the disc becomes higher, the disc drive designed for the disc having a low recording speed may not be compatible with the disc having the high recording speed. For example, the disc drive designed for a disc having a speed that is higher than 5X may not normally records data on the disc having the recording characteristics according to a recording speed that is slower than 5X. However, the disc drive can easily manage an optical disk since information on all recordable speeds is recorded thereon.

Moreover, if version-related information in accordance with disc standards is recorded with the recording speed information in the disc-related information zone 10a, the disc drive can also easily manage disc version-related problems. Data is recorded or reproduced by a disc drive corresponding to a version recorded in the disc-related information zone 10a. However, if the version is updated, the disc drive may have

difficulties in reading the updated disc version. Thus, the disc drive cannot record or reproduce the data due to errors occurring in connection with the updated disc version, although the disc drive satisfies the recording characteristics of the disc.

For example, if a recording speed is 1X through 3X for a 1.0 disc version, and the recording speed is 2X through 5X for a 2.0 disc version, a disc drive for 1.0 version cannot normally record or reproduce data to or from a 2.0 disc version. However, considering only the recording characteristics of the disc drive, the disc drive for the 1.0 disc version may record data at 2X or 3X. In this case, according to the present invention, the data can be recorded by using a recordable speed recorded in a re-recordable area, though the disc version is changed. That is, if the disc drive satisfies record characteristics using recordable speed information that is reproduced by the sum channel ch1, the disc drive records data irrespective of the version of the disc.

The first through third embodiments of the present invention can be applied to a multi-layered optical information storage medium. A speed flag or code that represents such recordable speed information must be recorded only by a disc manufacturer and protected from being changed or erased by a disc drive after a disc is marketed.

Industrial Applicability

As described above, an optical information storage medium according to the present invention and a recording/reproducing method performed in the storage medium can cope with the case where all of the recording layers cannot satisfy the formal recording speed information due to errors occurring during the manufacture of a storage medium. In particular, with a recent trend toward a higher recording capacity, there is an increasing need for an optical information storage medium and a method according to the present invention.

In an optical information storage medium according to the present

invention and a recording/reproducing method for the same, the defective disc proportion can be reduced, and loss of user data due to application of inaccurate recording layer information can be prevented.

What is claimed is:

1. An optical information storage medium, wherein formal recording speed information, which is reproduced by a differential signal channel, is recorded on a read-only area, and maximum recordable speed information, which is reproduced by a sum channel, is recorded in a recordable zone of an area other than a user data area.

2. The optical information storage medium of claim 1, wherein the formal recording speed information is recorded in a high-frequency wobble.

3. The optical information storage medium of claim 1, wherein the formal recording speed information is recorded in a pit shape that is reproduced using a sum channel.

4. The optical information storage medium of one of claims 1 to 3, wherein a lead-in area, a user data area, and a lead-out area are included, and the maximum recordable speed information is recorded in a re-recordable data zone of at least one of the lead-in area and the lead-out area.

5. The optical information storage medium of claim 4, wherein the maximum recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

6. The optical information storage medium of claim 4, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the maximum recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

7. The optical information storage medium of claim 4, wherein the maximum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

8. The optical information storage medium of claim 4, wherein minimum recordable speed information is also recorded in the re-recordable data zones of the lead-in and lead-out areas.

9. The optical information storage medium of claim 8, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the minimum recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

10. The optical information storage medium of claim 8 or 9, wherein the maximum recordable speed information and the minimum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

11. The optical information storage medium of claim 8 or 9, wherein the maximum recordable speed information and the minimum recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

12. An optical information storage medium, wherein formal recording speed information, which is reproduced by a differential signal channel, is recorded on a read-only area, and recordable speed

information, which is reproduced by a sum channel, is recorded in a recordable zone of an area other than a user data area.

13. The optical information storage medium of claim 12, wherein the formal recording speed information is recorded in a high-frequency wobble.

14. The optical information storage medium of claims 12 and 13, wherein a lead-in area, a user data area, and a lead-out area are included, and the recordable speed information is recorded in a re-recordable data zone of at least one of the lead-in area and the lead-out area.

15. The optical information storage medium of claim 14, wherein the recordable speed information corresponding to each bit of a predetermined byte of the re-recordable area is recorded using each bit or a combination of bits.

16. The optical information storage medium of claim 14, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

17. The optical information storage medium of claim 15 or 16, wherein the recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

18. A method of recording/reproducing data in/from an optical information storage medium that is constituted of a lead-in area, a user data area, and a lead-out area, the method comprising:

recording formal recording speed information in a read-only data zone of at least one of the lead-in area and the lead-out area;

recording maximum recordable speed information in a re-recordable data zone of at least one of the lead-in area and the lead-out area; and

recognizing the maximum recordable speed information using a disc drive and recording data.

19. The recording/reproducing method of claim 18, wherein the formal recording speed information is recorded in a high-frequency wobble or a pit.

20. The recording/reproducing method of claim 18 or 19, wherein the maximum recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

21. The recording/reproducing method of claim 20, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the maximum recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

22. The recording/reproducing method of claim 18, 19 or 21, wherein the maximum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

23. The recording/reproducing method of claim 20, wherein the maximum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

24. The recording/reproducing method of claim 35, wherein minimum recordable speed information is also recorded in the re-recordable data zones of the lead-in and lead-out areas.

25. The recording/reproducing method of claim 24, wherein the maximum recordable speed information and the minimum recordable speed information is redundantly recorded in the re-recordable data zones of the lead-in and lead-out areas.

26. The recording/reproducing method of claim 24 or 25, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the maximum recordable speed information and the minimum recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

27. The recording/reproducing method of claim 24 or 25, wherein the maximum recordable speed information and the minimum recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

28. The recording/reproducing method of claim 24 or 25, wherein the optical information storage medium performs recording by

using the maximum recordable speed information and the minimum recordable speed information irrespective of a version of the disc.

29. A method of recording/reproducing data in/from an optical information storage medium that is constituted of a lead-in area, a user data area, and a lead-out area, the method comprising:

recording formal recording speed information in a read-only data zone of at least one of the lead-in area and the lead-out area;

recording recordable speed information in a re-recordable data zone of at least one of the lead-in area and the lead-out area; and

recognizing the recordable speed information using a disc drive and recording data.

30. The recording/reproducing method of claim 29, wherein the formal recording speed information is recorded in a high-frequency wobble or a pit.

31. The recording/reproducing method of claim 29 or 30, wherein the recordable speed information is recorded as a recording layer flag or code using at least one bit or a bit combination of a predetermined byte in the re-recordable data zone.

32. The recording/reproducing method of claim 29 or 30, wherein minimum recordable speed information is also recorded in the re-recordable data zones of the lead-in and lead-out areas.

33. The recording/reproducing method of claim 29 or 30, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the recordable speed information is

recorded in any of the at least one disc control data area and the reserved area.

34. The recording/reproducing method of claim 32, wherein the re-recordable data zone includes a disc control data zone that has at least one disc control data area in which disc control data is recorded and a reserved area, and the recordable speed information is recorded in any of the at least one disc control data area and the reserved area.

35. The recording/reproducing method of claim 29 or 30, wherein the optical information storage medium performs recording by using the recordable speed information irrespective of a version of the disc.

36. The optical information storage medium of claims 1, 3 and 12, wherein the formal recording speed information is recorded in a pit shape that is reproduced using a sum channel.

37. The optical information storage medium of claims 1, 3, 12, and 36, wherein the optical information storage medium has a plurality of recording layers.

38. The optical information storage medium of claim 18 or 28, wherein the optical information storage medium and the recording/reproducing method have a plurality of recording layers.

FIG. 1

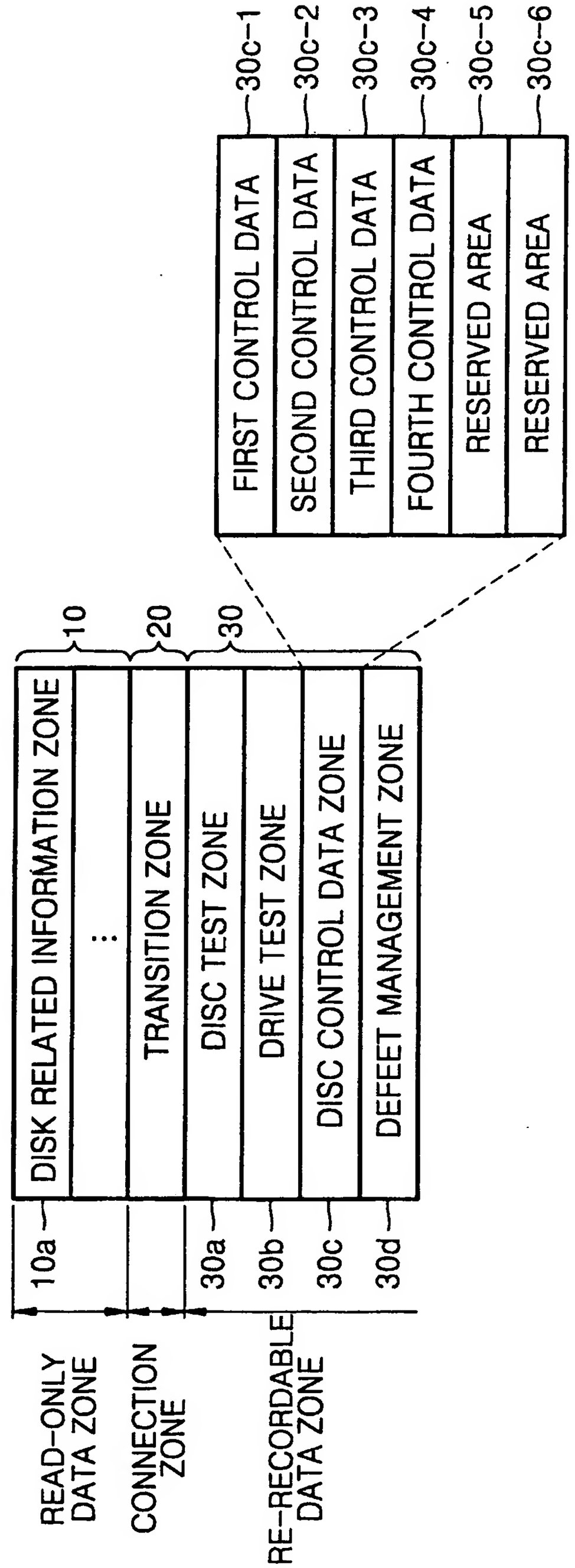

DISK RELATED INFORMATION ZONE
TRANSITION ZONE
DISC TEST ZONE
DRIVE TEST ZONE
DISC CONTROL DATA ZONE
DEFEET MANAGEMENT ZONE
10
20
30
10a
30a
30b
30c
30d
READ-ONLY DATA ZONE
CONNECTION ZONE
RE-RECORDABLE DATA ZONE
30c-1
30c-2
30c-3
30c-4
30c-5
30c-6
FIRST CONTROL DATA
SECOND CONTROL DATA
THIRD CONTROL DATA
FOURTH CONTROL DATA
RESERVED AREA
RESERVED AREA

FIG. 2

30

BP	CONTENTS	THE NUMBER OF BYTES
35 — 0	RECORDABLE SPEED FLAG OR CODE	ONE BYTE
1~	RESERVED	RESERVED

FIG. 3A

35

b7	b6	b5	b4	b3	b2	b1	b0
MAXIMUM RECORDABLE SPEED		RESERVED					

FIG. 3B

35

b7	b6	b5	b4	b3	b2	b1	b0
MAXIMUM RECORDABLE SPEED				MINIMUM RECORDABLE SPEED			

FIG. 4

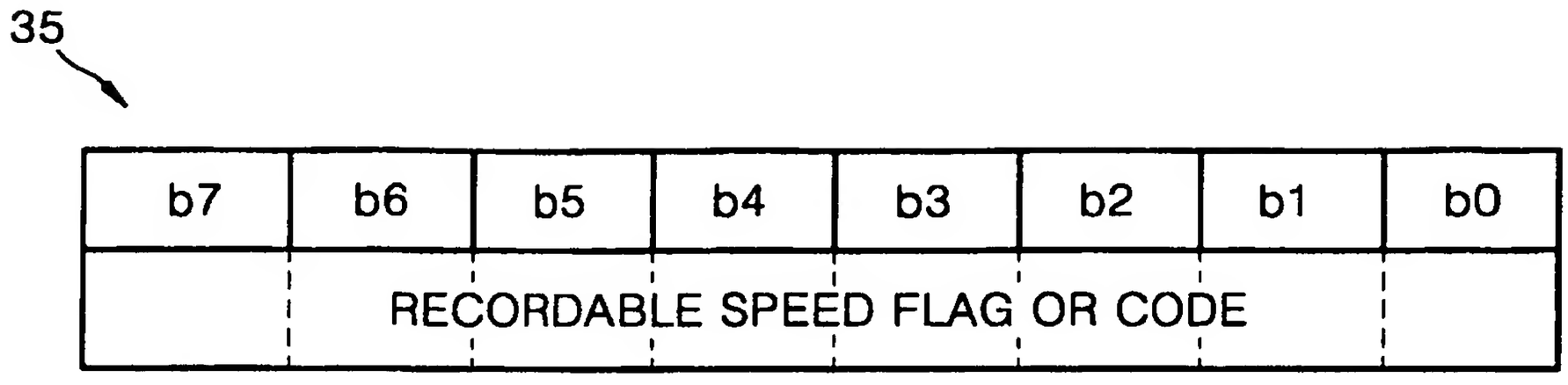
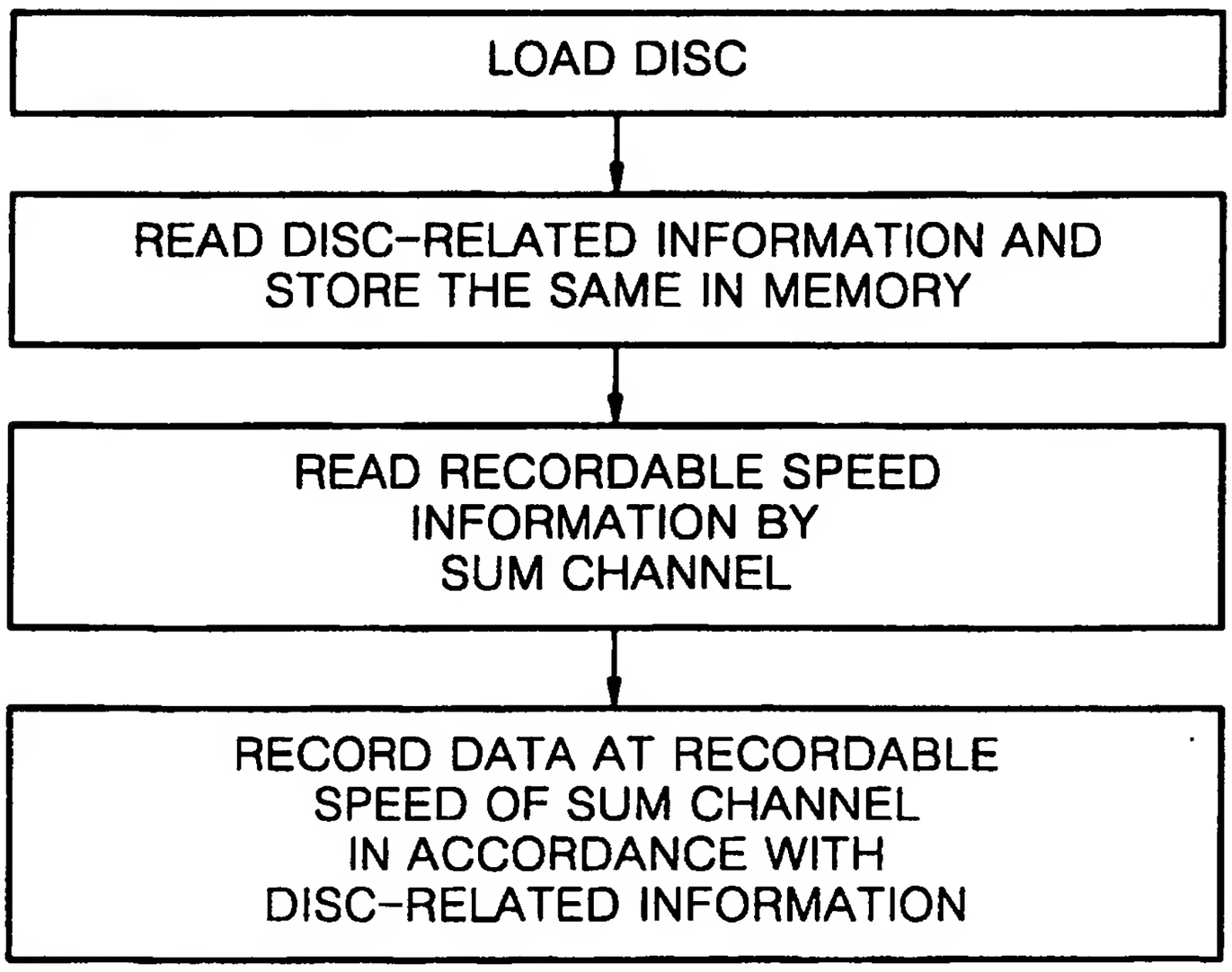

35
b7
b6
b5
b4
b3
b2
b1
b0
RECORDABLE SPEED FLAG OR CODE

FIG. 5


LOAD DISC
READ DISC-RELATED INFORMATION AND STORE THE SAME IN MEMORY
READ RECORDABLE SPEED INFORMATION BY SUM CHANNEL
RECORD DATA AT RECORDABLE SPEED OF SUM CHANNEL IN ACCORDANCE WITH DISC-RELATED INFORMATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR03/00501

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G11B 7/004

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G11B 7/00-7/24, G11B 20/00-20/24, G06F 17/00-17/22, G11B 19/02, G11B 21/08,G11B 17/22, G11B 5/09, H04N 5/92

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the intertnational search (name of data base and, where practicable, search terms used)
WPI, PAJ "formal" ,"record*", "speed", "read", "rewrit*", "maximum", "differ*", "channel", "sum", "wobble", "pit", "flag", "code"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 09-251407 A (MATSUSHITA ELEC. IND. CO. LTD.) 22 SEPTEMBER 1997, see the whole document	1
A	US 6388959 B1(SONY CORP.) 14 MAY 2002, see the whole document	1
A	EP 628964 B1 (SONY CORP.) 25 AUGUST 1999, see the whole document	1
A	JP 05-12784 A (PIONEER ELEC. CORP.) 22 JANUARY 1993, see the whole document	1
A	US 5561644 A (SONY CORP.) 01 OCTOBER 1996 see the whole document	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 JUNE 2003 (30.06.2003)	30 JUNE 2003 (30.06.2003)

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	SONG, Jin Suk Telephone No. 82-42-481-5694

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